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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s):	Maligeorgos, James
Title:	Voltage Controlled Quadrature Oscillator With Phase Tuning
Serial No.:	09/776,392 Filing Date: February 2, 2001
Examiner:	Unknown Group Art Unit: Unknown
Docket No.:	39823-P002US (f/k/a M-12181 US)

Dallas, Texas
August 13, 2002

COMMISSIONER FOR PATENTS
Washington, D. C. 20231

PRELIMINARY AMENDMENT

Dear Sir:

This paper is responsive to the Notice of Omitted Item(s) in a Provisional Application dated June 12, 2002.

AMENDMENTS

In The Specification

Please delete the first sentence of the second full paragraph on page 4, lines 8-9.

Additionally, please delete on page 5, under the heading "Brief Description of the Drawings," paragraph 5, lines 21-22.

REMARKS

Text referencing Fig. 1D (prior art) has been removed from the application. Applicant does not believe that such text is essential material under 35 U.S.C. § 112.

Should the Examiner have any questions or issues that might be subject to resolution through a telephonic interview, the Examiner is requested to telephone the undersigned at (512) 474-4330.

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Attached hereto is a marked-up version of the changes made to the specification by the current amendment. The attached page is captioned **"Version With Markings To Show Changes Made."**

<div align="center">Respectfully submitted,</div>

Michael P. Adams
Attorney for Applicant(s)
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CERTIFICATION UNDER 37 C.F.R. § 1.8

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I hereby certify that this correspondence (along with any item referred to as being enclosed herewith) is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to Commissioner for Patents, Washington, D.C. 20231, on August 13, 2002.

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Signature

VERSION WITH MARKINGS TO SHOW CHANGES MADE

In The Specification

Please amend the specification as follows:

Please replace the paragraph starting on page 4, lines 8-9 with the following rewritten paragraph:

[Figure 1D illustrates a plot of the image rejection calculated as a function of the total phase and amplitude error in an image-reject-mixer.] The quadrature local oscillator (LO) accuracy attained using most high-frequency I-Q signal generation techniques is on the order of < 1° resulting in a maximum image rejection on the order of ~ 40-50 dB. This assumes that an ideal IF quadrature combiner is available and that no quadrature LO phase tuning is performed.

Additionally, please amend the text under the heading "Brief Description of the Drawings," page 5, lines 14-26, and page 6, lines 1-14, as follows:

The present invention may be better understood, and its numerous objects, features and advantages made apparent to those skilled in the art by referencing the accompanying drawings.

Figure 1A, labeled prior art, illustrates a block diagram of a frequency halving circuit.

Figure 1B, labeled prior art, illustrates a conventional heterodyne receiver front end.

Figure 1C, labeled prior art, is a block diagram of an image reject mixer based on the Hartley topology.

[Figure 1D, labeled prior art, illustrates a graph of image rejection versus amplitude and phase errors in quadrature signals.]

Figure 2 is a block diagram of a differential two-stage oscillator with variable quadrature output phases according to an embodiment of the present invention.

Figure 3 is a schematic diagram of the circuit of Figure 2 according to an embodiment of the present invention.

Figure 4 is a schematic of a differential regenerative frequency divider according to an embodiment of the present invention.

Figure 5 is a block diagram of an improved image reject mixer according to an embodiment of the present invention.

Figure 6 illustrates a flow diagram of image reject mixer operation according to an embodiment of the present invention.

Figure 7 illustrates a graph illustrating a typical image amplitude at IF versus phase or amplitude tuning control input.

Figure 8 illustrates a preferred embodiment of an image reject mixer calibration method using tau-dither tracking.

Figure 9 illustrates waveforms associated with the tau-dither based image-reject calibration loop.

The use of the same reference symbols in different drawings indicates similar or identical items.